UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/298,372	04/23/1999	SING BING KANG	DEC99-34	1976

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IP Administration
Legal Departmen, M/S 35
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EXAMINER
YENKE, BRIAN P

ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 02/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _Amendment (10 December 2003)_.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under _Ex parte Quayle_, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1,2,4-7,9-12,14-17,19-22 and 25-46_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1,2,4-7,9-12,14-17,19-22 and 25-46_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

    a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.

4) ☐ Interview Summary (PTO-413) Paper No(s). _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1.   Applicant's arguments with respect to the claims have been considered but are

not persuasive.

Claim Rejections - 35 USC § 112

2.   The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-2, 4-7, 9-12, 14-17 , 19-22 and 25-46 are rejected under 35 U.S.C. 112,

first paragraph, as failing to comply with the written description requirement. The

claim(s) contains subject matter which was not described in the specification in such a

way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the

time the application was filed, had possession of the claimed invention. Independent

claims 1, 6, 11, 16 and 21 now recite a negative limitation "such that camera calibration

is achieved according to the determined pixel intensity drop off to the exclusion of other

image factors", which is not disclosed in the applicant's specification. The examiner has

rejected the claims below based upon the absence of the applicant's disclosure

including the above limitations. Therefore the previous rejection which was provided

prior to the amendment, is repeated below.

3.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-2, 4-7, 9-12, 14-17, 19-22 and 25-46 are rejected under 35 U.S.C. 112,

second paragraph, as being indefinite for failing to particularly point out and distinctly

claim the subject matter which applicant regards as the invention. Independent claims

1, 6, 11, 16 and 21 now recite "to the exclusion of <u>other image factors</u>", where "other

image factors" is indefinite since the claim does not include what "other image factors"

are excluded.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1,2,4-7,9-12,14-17,19-22 and 25-46 rejected under 35 U.S.C. 103(a) as

being unpatentable over **Carmeli, US 5,699440 in view of Stein et al., US 6,052,124**.

In considering claims 1, 6, 11, 16 and 21,

Carmeli, discloses a system which tests the performance of at least one electro-

optical test devices, which include a light source, test target, lens and an imaging

system.   The electro-optical system includes a test generator 19, display 18, lens 13

and calibrated camera 12 (Fig 1a/b).   A computer 17 which processes the information

from system 11 via digitizer 16 (Fig 1a/b), includes a memory (col 5, line 15-23) where a

stored database is located, and also includes analysis unit.

1) *the claimed digitizing an image of a blank textureless surface having a uniform*

illumination is met by digitizer 16 (Fig 1a/b) which digitizes a blank textureless surface

as shown in Fig 10a (col 11, line 11-16)

2) *the claimed from the digitized image, determining pixel intensity drop off caused by a*

vignetting effect is met where the system test for vignetting and the pixel drop

associated with vignetting, where Fig 10a is an ideal input signal, and Fig 10b is the

output signal and the result of vignetting.

However, Carmeli remains silent on computing intrinsic parameters of the

camera other than pixel intensity drop off using the determined pixel intensity drop off.

Carmeli discloses a system which tests the performance of the system (includes light

source, target 14, lens 13 and camera 12) which includes the performances of one or

more of the selected devices to the testing device can be either the camera 12, lens 13,

target 14 and light source 15, where the other components (non-testing) are high

performance pre-calibrated components (col 5, line 12-23). The testing device (e.g.

camera) is analyzed by computer 17 which includes an analysis unit for analyzing the

performance of the system 11 and in particular of the test device therein. Carmeli,

discloses in Fig 10a which shows a uniform light function 43, and the result illustrated in

Fig 10b attributed to vignetting, in order to analyze/evaluate the effect of vignetting.

Computer 17 computes the performance/calibration of various functions (col 6, line 10-29) where the database of memory (computer 17) stores pre-calibrated data of the devices/components for proper alignment. The analysis unit (of computer 17) analyzes the digitized image to determine performance of the electro-optical component to be representative of the system and being equal to the product of component performances of each test device and of each pre-calibrated device to determine: a) Modular Transfer Function; b) Contrast Transfer Function; c) Grey Level Linearity; d) Illumination Uniformity; e) Geometrical Distortion; d) Signal to Noise Ratio; e) Transient Response; h) Blemishes; i) Blooming and j) Chromaticity.

A device is tested by comparing a distorted image due to aberrations with the test device, with a theoretical ideal image which would be obtained if the test device were replaced by an equivalent high performance device. Carmeli also discloses the parameters which the device might include where the data is an inherent part of the components specification (col 7, line 49-57). Carmeli discloses inherent parameters which include, aspect ratio, focal length and calibration data to name a few (col 7 line 49 to col 8, line 9).

Carmeli, also discloses that in the reverse situation the analysis can be performed with the specific, limited range of components available to the user who needs to correlate the analysis software within the computer 17 to the range of components actually in his possession. Thus, Carmeli is able to load the parameters of a selected device onto the database, in the event the particular device is not stored in the database. Carmeli, discloses there are various parameters of the pre-calibrated and

tested devices (col 7, line 59 to col 8 line 64), where the camera parameters might include the size of the image, type of video signal standard (EIA, CCIR, PAL, NTSC, etc), aspect ratio, type of imager and pixel size, where the lens specification includes the focal length. This data is used in determining the performance of the system. Thus Carmeli, determines the performance of the system and the tested device, based upon the analyzed digitized image and the stored data for the pre-calibrated devices and thus is able to calibrate the camera or selected test device, which was not done in prior art (col 3, line 5-13).

The examiner incorporates Stein et al., US 6,052,124 which discloses the well known intrinsic parameters related to a camera. Stein discloses in the background that the intrinsic parameters of the camera can be represented by the image's aspect ratio, the skew, principal point, and where focal length is related to the aspect ratio.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify/utilize in Carmeli, which discloses a system for testing the performance of a selected device/system where the device/system's performance is determined based upon an ideal precalibrated device, by using the well known intrinsic parameters of the device (i.e. camera) in calculating the performance of the device/system, since the intrinsic parameters of the device determine it's performance.

In considering claims 2, 7, 12, 17 and 22, the claimed wherein the pixel intensity drop off is also caused by an off-axis pixel projection effect, is met where the pixel intensity drop off can be caused by an off-axis pixel as shown in Fig 9a/b and Fig 11.

In considering claims 4, 9, 14 and 18-19, the claimed wherein the step of computing is dependent on a camera tilt effect is met where the performance of the system/device is calculated/computed based on the alignment step of the image, Fig 2A.

In considering claim 5, 10, 15, 20 and 25, *the claimed computing parameters of a model by minimizing the difference between the digitized image and the model* is met by computer 17 in which the stored database in the memory which stores pre-calibrated components is analyzed by the analyzer (computer 17) after the image is digitized. The digitized image is produced under control of the software stored in computer 17 (col 6, line 48-50) which selects from the database the corresponding standard pre-calibrated components whose physical and optical data are known. Then once the image is formed/digitized, the analyzer is able to determine the resulting performance of a test device or the product of the performances and then displayed (Fig 2a-d).

In considering claim 26, 31 and 41, *the claimed wherein the intrinsic parameter is selected from the group consisting of focal length, principal point, skew and aspect ratio.*

As stated above, Carmeli remains silent on computing intrinsic parameters of the camera other than pixel intensity drop off by using the pixel intensity drop off.

However, Carmeli does disclose Carmeli discloses a system which tests the

performance of the system (includes light source, target 14, lens 13 and camera 12)

which includes the performances of one or more of the selected devices to the testing

device can be either the camera 12, lens 13, target 14 and light source 15, where the

other components (non-testing) are high performance pre-calibrated components (col 5,

line 12-23). The testing device (e.g. camera) is analyzed by computer 17 which includes

an analysis unit for analyzing the performance of the system 11 and in particular of the

test device therein. Carmeli, discloses in Fig 10a which shows a uniform light function

43, and the result illustrated in Fig 10b attributed to vignetting, in order to

analyze/evaluate the effect of vignetting. Computer 17 computes the

performance/calibration of various functions (col 6, line 10-29) where the database of

memory (computer 17) stores pre-calibrated data of the devices/components for proper

alignment. The analysis unit (of computer 17) analyzes the digitized image to determine

performance of the electro-optical component to be representative of the system and

being equal to the product of component performances of each test device and of each

pre-calibrated device to determine:

a) Modular Transfer Function; b) Contrast Transfer Function; c) Grey Level Linearity; d)

Illumination Uniformity; e) Geometrical Distortion; d) Signal to Noise Ratio; e) Transient

Response; h) Blemishes; i) Blooming and j) Chromaticity.

Carmeli also discloses the parameters which the device might include where the

data is an inherent part of the components specification (col 7, line 49-57). Carmeli

discloses inherent parameters which include, aspect ratio, focal length and calibration

data to name a few (col 7 line 49 to col 8, line 9).

The examiner incorporates Stein et al., US 6,052,124 which discloses the well

known intrinsic parameters related to a camera. Stein discloses in the background that

the intrinsic parameters of the camera can be represented by the image's aspect ratio,

the skew, principal point, and where focal length is related to the aspect ratio.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time of the invention to modify/utilize in Carmeli, which discloses a system for testing

the performance of a selected device/system where the device/system's performance is

determined based upon an ideal precalibrated device, by using the well known intrinsic

parameters of the device (i.e. camera) in calculating the performance of the

device/system, since the intrinsic parameters of the device determine it's performance.

In considering claims 27, 32 and 42, *the claimed wherein the intrinsic parameter*

is focal length REFER TO CLAIM 26 ABOVE.

In considering claims 28, 33 and 43, *the claimed wherein the intrinsic parameter*

is principal point REFER TO CLAIM 26 ABOVE.

In considering claims 29, 34 and 44, *the claimed wherein the intrinsic parameter*

is skew REFER TO CLAIM 26 ABOVE.

In considering claims 30, 35 and 45, *the claimed wherein the intrinsic parameter*

is aspect ratio REFER TO CLAIM 26 ABOVE.

In considering claim 46,

1) *the claimed digitizing an image of a blank textureless surface having a uniform illumination* is met by digitizer 16 (Fig 1a/b) which digitizes a blank textureless surface as shown in Fig 10a (col 11, line 11-16)

2) *the claimed from the digitized image, determining pixel intensity drop off caused by a vignetting effect* is met where the system test for vignetting and the pixel drop associated with vignetting, where Fig 10a is an ideal input signal, and Fig 10b is the output signal and the result of vignetting.

However, Carmeli does not specifically disclose, computing the focal length of the camera using the determined pixel intensity drop off.

Carmeli discloses a system which tests the performance of the system (includes light source, target 14, lens 13 and camera 12) which includes the performances of one or more of the selected devices to the testing device can be either the camera 12, lens 13, target 14 and light source 15, where the other components (non-testing) are high performance pre-calibrated components (col 5, line 12-23). The testing device (e.g. camera) is analyzed by computer 17 which includes an analysis unit for analyzing the performance of the system 11 and in particular of the test device therein. Carmeli, discloses in Fig 10a which shows a uniform light function 43, and the result illustrated in Fig 10b attributed to vignetting, in order to analyze/evaluate the effect of vignetting. Computer 17 computes the performance/calibration of various functions (col 6, line 10-29) where the database of memory (computer 17) stores pre-calibrated data of the devices/components for proper alignment. The analysis unit (of computer 17) analyzes

the digitized image to determine performance of the electro-optical component to be

representative of the system and being equal to the product of component

performances of each test device and of each pre-calibrated device to determine:

a) Modular Transfer Function; b) Contrast Transfer Function; c) Grey Level Linearity; d)

Illumination Uniformity; e) Geometrical Distortion; d) Signal to Noise Ratio; e) Transient

Response; h) Blemishes; i) Blooming and j) Chromaticity.

Carmeli also discloses the parameters which the device might include where the

data is an inherent part of the components specification (col 7, line 49-57).   Carmeli

discloses inherent parameters which include, aspect ratio, focal length and calibration

data to name a few (col 7 line 49 to col 8, line 9).

The examiner incorporates Stein et al., US 6,052,124 which discloses the well

known intrinsic parameters related to a camera. Stein discloses in the background that

the intrinsic parameters of the camera can be represented by the image's aspect ratio,

the skew, principal point, and where focal length is related to the aspect ratio.

Therefore, it would have been obvious to one of ordinary skill in the art at the

time of the invention to modify/utilize in Carmeli, which discloses a system for testing

the performance of a selected device/system where the device/system's performance is

determined based upon an ideal precalibrated device, by using the well known intrinsic

parameters (focal length) of the camera in calculating the performance of the camera,

since the focal length is an intrinsic parameters of the camera and thus determines it's

performance.

Applicant's Arguments

a)   Regarding independent claims 1,6,11,16,21 and 46, the applicant states that

Carmeli does not even discuss calibration of the camera.

b)   Regarding independent claims 1,6,11,16,21 and 46, the applicant states that

Carmeli merely measures the pixel intensity drop off (illumination uniformity), and this is

the end result there is no use of that parameter to compute another intrinsic parameter

of the camera (such as focal length).

c)   Regarding independent claims 1,6,11,16,21 and 46, the applicant states that

Stein merely discusses computing intrinsic parameters of the camera through the use of

specialized patterns or from more than two views of a scene.   Thus, the applicant

states there is no reason to combine Stein with Carmeli.

Examiner's Response

a)   The examiner disagrees. Carmeli's discussion in the background discusses one

of the problems with the prior art is that no absolute calibration of the television camera

is provided (col 3, line 8-10). Carmeli's system does test the performance of the

system, where one of the devices (i.e. camera, reticle, optics and light source) is

tested/calibrated, where the other non-selected tested items are defined as pre-

calibrated/already calibrated (col 8, line 17-26).

b)   The examiner disagrees that Carmeli's end result is measuring the pixel intensity

drop off (illumination uniformity). Carmeli determines the effects of vignetting (pixel

intensity drop off) on a system to determine the performance of at least one electro-

optical test device, selected to be the camera 12, lens 13, target 14 and light source 15,

where the other components (non-testing) are high performance pre-calibrated

components (col 5, line 12-23). As shown in (col 8, line 17-64), Carmeli is (in this

instance) testing/calibrating the camera where the other components; reticle, optics and

light source are already calibrated. Thus the effects of the vignetting effect on the

system is used to determine/calculate the performance of the system utilizing known

pre-calibrated devices. Carmeli's as stated above, computes (computer 17) the

performance/calibration of various functions (col 6, line 10-29) where the database of

memory (computer 17) stores pre-calibrated data of the devices/components for proper

alignment. The analysis unit (of computer 17) analyzes the digitized image to determine

performance of the electro-optical component to be representative of the system and

being equal to the product of component performances of each test device and of each

pre-calibrated device to determine:

a) Modular Transfer Function; b) Contrast Transfer Function; c) Grey Level Linearity; d)

Illumination Uniformity; e) Geometrical Distortion; d) Signal to Noise Ratio; e) Transient

Response; h) Blemishes; i) Blooming and j) Chromaticity.

A device is tested by comparing a distorted image due to aberrations with the test

device, with a theoretical ideal image which would be obtained if the test device were

replaced by an equivalent high performance device. Carmeli also discloses the

parameters which the device might include, where the data is an inherent part of the

components specification (col 7, line 49-57). Carmeli discloses inherent parameters

which include, aspect ratio, focal length and calibration data to name a few (col 7 line 49 to col 8, line 9).

It should also be noted that once an element is calibrated, that element's parameters would be used in the analysis of the next performance/test (i.e. if the camera is the element that has been calibrated, that calibrated data would be used in determining the performance of the selected element in the system).

Also, as stated by Carmeli, some of the shortcomings of prior art include, no absolute calibration of the television camera (col 3, line 8-10). Thus Carmeli provides a system which can test the performance the system and/or of a component thereof, in order to provide greater accuracy and ease of measurement than provided in previous proposed methods/system.

Therefore in order to determine the performance of the system/component and to calibrate the camera, it would be obvious to use the inherent/intrinsic parameters of the camera, since the intrinsic/inherent parameters of a camera determine it's performance and would be needed for calibration.

c)   The examiner disagrees there is no motivation to combine Stein with Carmeli. As stated above (examiner's comments (a)), Carmeli discloses a system which tests the performance of a system/component which are used to calibrate the tested component/non-calibrated device, a camera in this instance. Stein was relied upon by the examiner, to illustrate that a camera has intrinsic parameters such as the image's

aspect ratio, the skew, principal point, and where focal length is related to the aspect

ratio.

Carmeli does disclose there are various parameters of the pre-calibrated and

tested devices (col 7, line 59 to col 8 line 64), where the camera parameters might

include the size of the image, type of video signal standard (EIA, CCIR, PAL, NTSC,

etc), aspect ratio, type of imager and pixel size, where the lens specification includes

the focal length.

Therefore, it would have been obvious to one of ordinary skill in the art at

the time of the invention to modify Carmeli which discloses a system for testing the

performance of the system/component where the selected component(s) being tested is

uncalibrated being compared to ideal precalibrated devices, by using the intrinsic

parameters of a camera as taught by Stein, since the intrinsic parameters of a camera

are needed for calibration and determine it's performance.

Conclusion

5.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.

6.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Brian Yenke whose telephone number is (703) 305-

9871. The examiner work schedule is Monday-Thursday, 0730-1830 hrs.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

Supervisor, John W. Miller, can be reached at (703)305-4795.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal

Drive, Arlington, VA, Sixth Floor (Receptionist).Any inquiry of a general nature or

relating to the status of this application or proceeding should be directed to the

Technology Center 2600 Customer Service Office whose telephone number is\

(703)305-HELP.

B.P.Y
January 31, 2004

JOHN MILLER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600